2. Description of JADS EW JT&E

As described in the previous section, JADS was directed by charter to develop a PTD that defines the requirements, test, evaluation, and resources necessary to incorporate EW testing into the JADS JT&E. This section of the PTD describes EW T&E concerns and problems addressed by the JADS EW test, as well as the objectives, limitations and constraints, scope, and overall concept of the JADS EW test.

2.1 Nomination Concerns & Problems

The original direction to develop a JADS EW test was based upon recognized shortfalls in the Service's abilities to test and evaluate EW systems and a perception that ADS could be used to overcome or reduce many of these shortfalls. Early in the development of the JADS EW test concept, JADS conducted a comprehensive survey of DoD's ongoing efforts to employ ADS technology in EW testing. The survey showed that while many of the major T&E centers were experimenting with ADS to support various facets of EW testing, these efforts tended to be technology demonstrations focused on resolving limitations within the individual test centers' infrastructure. None of the efforts where focused on answering the question posed to the JADS JT&E: "How could ADS be used to address the inherent shortfalls in EW T&E?"

2.1.1 EW Test Process

The DoD has a long history of developing and testing EW systems that dates back to World War II. Over this period each of the Services has established test facilities and internal test processes designed to test and evaluate a wide range of EW systems. While each Service's facilities and procedures are tailored to match unique Service requirements, the overall process for testing EW systems is similar across the Services. Figure 2-1 shows the EW Systems Life Cycle and the T&E resources used to support the process. Typical T&E resources for EW T&E are addressed in the subsequent paragraphs.

2.1.1.1 Modeling and Simulation

Modeling and simulation (M&S) plays a significant role throughout the EW test process and at all levels of complexity (engineering, platform, mission, and theater or campaign). Early in the acquisition process, M & S is used to predict the proposed system performance prior to the development of hardware. As hardware is developed, M & S provides an audit trail for tracking operational requirements to test criteria. In addition, M & S allows evaluation of EW systems in complex or dangerous environments or scenarios that can not be simulated in ground test facilities or in open air testing. M & S is unique in that it can support system test and evaluation prior to the development of hardware and it is the only test resource that supports operational effectiveness evaluations at the campaign level. Limitations in M & S to support EW testing include a lack of fidelity in replicating certain complex EW functions and a corresponding wide confidence interval when using M & S to predict absolute performance or effectiveness of EW systems.

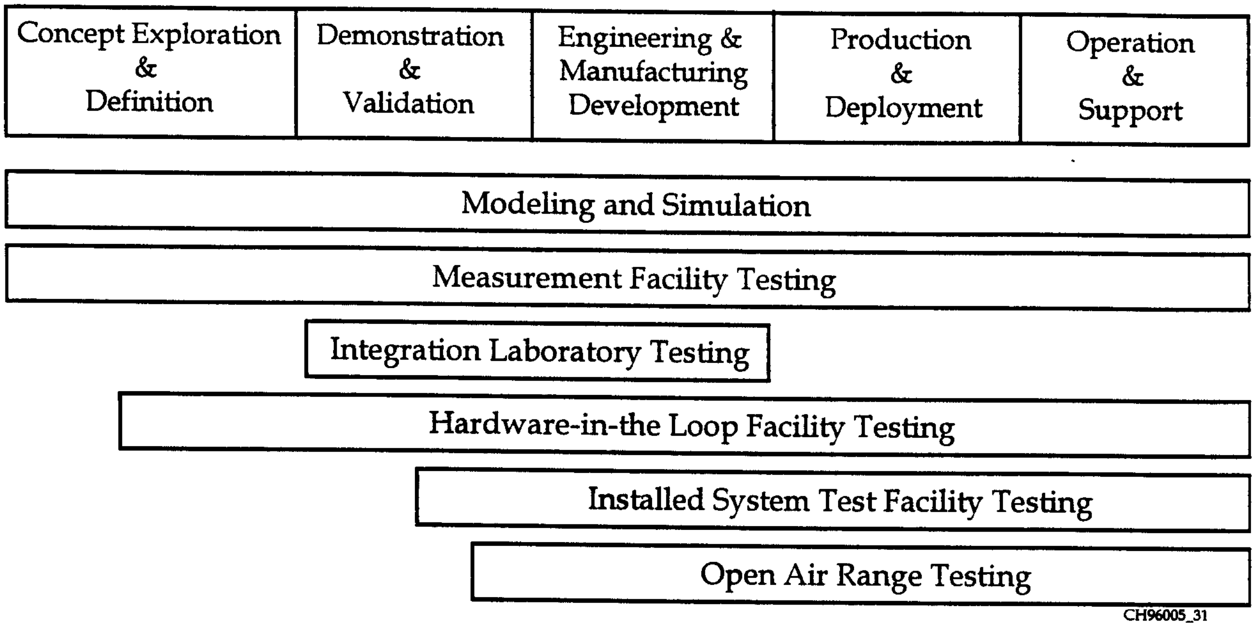

Figure 2-1. EW Systems Life Cycle

2.1.1.2 Measurement Facilities

Measurement facilities are also employed throughout the EW test process. Measurement facilities are used to measure parameters which contribute to EW performance and effectiveness, test specialized EW components or techniques to optimize design, and acquire input data for digital models. Measurement facilities provide empirical data to characterize processes which cannot be emulated accurately. Their main limitations are that they typically do not have the resources to simulate EW systems or evaluate EW system level performance or effectiveness.

2.1.1.3 System Integration Laboratories

System Integration Laboratories (SILs) are used to facilitate the integration of EW and avionics components in a building block approach. During the integration process, EW systems are stimulated with injected signals designed to represent appropriate threat signals. This type of stimulation allows static, open-loop performance testing of avionics components and serves as a baseline environment in which hardware and software changes can be tested. SILs allow testing down to the component level in the controlled environment of a full-up avionics testbed. Their primary limitation is they typically lack the resources to evaluate dynamic or closed-looped EW performance against threats and are therefore not capable of evaluating EW system effectiveness.

2.1.1.4 Hardware-in-the-Loop Facilities

Hardware-in-the-Loop (HITL) facilities provide a secure indoor test environment for testing EW techniques and hardware against threat system simulators or in some cases actual threat hardware. These facilities allow closed-loop effectiveness testing against enemy integrated air defense systems (IADS) prior to installing the EW system on the host platform. HITL test facilities allow detailed evaluation of EW effectiveness in a controlled, repeatable test environment against a small number of high fidelity threat systems. This limited high fidelity test environment is frequently augmented using emitter-only threat signal generators to produce a high density threat environment. In addition to the limited number of high fidelity signal sources available, other HITL limitations revolve around the lack of integration with the host aircraft. Host vehicle compatibility and interoperability and their potential impact on system effectiveness cannot be assessed at a high degree of fidelity in HITL facilities. In addition, simulation of all flight environment aspects, such as clutter and terrain effects, cannot be achieved with the same high confidence that can be achieved in open air flight tests.

2.1.1.5 Installed System Test Facilities

Installed System Test Facilities (ISTF) are used to evaluate EW system compatibility and interoperability with the host aircraft. These facilities provide pre-flight checkout and post-flight diagnostic capability. Like SILs, ISTFs support stimulation of avionics either by signal injection or free space radiation to test static EW performance at specific points in the employment envelope. Installed system testing allows EW system checkout on the host platform under controlled conditions. The primary limitation of ISTFs is they typically do not support dynamic testing or closed loop performance testing. As a result, they are normally not used to evaluate EW system effectiveness.

2.1.1.6 Open Air Test Ranges

Open Air Range (OAR) facilities are used to evaluate EW systems in an actual flight environment where environmental factors such as background radiation, terrain effects, clutter, noise, and atmospheric propagation exist. OARs are populated with a limited number of high fidelity threat simulators plus additional emitter-only threat signal generators in an attempt to provide the high density signal environment characterizing operational EW scenarios. OAR facilities attempt to provide a realistic flight environment and are the final step required to develop the high level of confidence required to certify EW systems for production. Their primary limitations are in achieving realistic battlefield threat densities and diversities, limited scenario flexibility due to range, resource and safety limitations, reduced statistical repeatability in testing, limited insight into the internal workings of the system under test, and relatively high cost.

2.1.2 EW Test Process Limitations

The existing EW test process, using a combination of M&S with measurement facility, SIL, HITL, ISTF, and OAR testing, is designed to make the most of existing T&E technologies and resources to provide a comprehensive evaluation of EW systems. The process is a building block approach designed to build upon the strengths and minimize the weaknesses of each of the available test resources. However, there are a number of known weaknesses in the application of the process. In addition to the limitations in the individual resources described above, two interrelated areas of particular concern in EW effectiveness testing are: problems associated with correlating and interpreting EW test results, and the availability of appropriate resources at the right levels of fidelity to support required T&E activities.

2.1.2.1 Correlation and Interpretation of Test Results

As an EW system moves within and between development phases, it is subject to a wide assortment of T&E activities. A typical EW system will be evaluated for effectiveness using a wide array of models and simulations at every level from component testing through campaign level evaluation. In addition, various system components and techniques will usually be evaluated in a wide array of measurement facilities. At the subsystem and system level, it is not uncommon for system effectiveness testing to occur in several HITL facilities and on multiple open air test ranges. Frequently, testing occurs across multiple Services. Test methodologies, test environments, and even measures of effectiveness (MOEs) can vary widely within and between each phase of the acquisition cycle. While the EW test process lays out a systematic methodology for accomplishing EW system testing and applying consistent MOEs, the bulk of the individual T&E events are largely independent of each other.

Typically, the integration of test results and the interpretation of the impact of these results on performance is left as an exercise for the EW system evaluators. Due to a number of issues (availability of hardware, scheduling, cost, etc.) the most common tool for accomplishing this type of integration and evaluation is M & S. Normally, it is left to the discretion of the EW system evaluators to determine when changes in anticipated hardware performance make it necessary or appropriate to verify mission and campaign level results using M & S. While M & S is a valuable tool for integrating and interpreting test results, as discussed earlier, it can lack the fidelity to predict absolute performance and effectiveness for complex EW functions. As a result, EW system evaluators are frequently faced with the requirement to apply "engineering judgment" to interpret the results of effectiveness testing on mission and campaign level performance. History shows EW system evaluators consistently fail to accurately predict the hardware level performance required to meet mission and campaign level effectiveness requirements and conversely, the impact of changes in hardware performance on mission and campaign level performance.

2.1.2.2 Availability and Fidelity of Resources

Lack of appropriate resources at the required level of fidelity to adequately evaluate effectiveness of the SUT is a problem that plagues every phase of the EW test process. While M & S has the flexibility to support the development of the large numbers of diverse players required for mission and campaign level evaluation of EW systems, high fidelity models of EW systems, threat systems, and other players on which to base the results of mission and campaign models are virtually nonexistent. Early in the development cycle, parametrics used to support development of mission and campaign models are frequently based upon "best engineering judgment." As a result, confidence in the mission and campaign analysis early in the development process is traditionally very low.

Using current resources and technologies, the bulk of the basic engineering specifications that determine system performance cannot be evaluated in a closed-loop environment until an EW system is relatively mature and can undergo HITL testing. While the fidelity of the test article and threat simulators at this phase of testing is normally much higher than in M & S, the availability of resources begins to limit test effectiveness. Scarcity of SUT assets, the requirement to locate the SUT in the HITL facility, and the geographic dispersion of threat simulators among the various test facilities limit the amount and detail of testing typically performed. System level effectiveness testing is evaluated again in both DT and OT OAR testing. In open air testing the fidelity of test assets can be quite good, but again, the limited number of available test articles and threat systems together with the geographic dispersion of available threat systems across various open air test ranges combine to limit the amount and quality of testing that can be accomplished.

Because of the inherent limitations in the individual resources available for testing EW systems and the more general problems of correlation, fidelity and availability of resources discussed above, most EW systems complete formal T&E with mission and campaign level evaluations that are predominantly based upon M & S. Additionally, these evaluations are weakly linked to the results of higher fidelity testing performed on the system. Finally, because of the cost, schedule, geographic separation of resources, and system availability issues, most systems will be evaluated against only a small portion of the resources available within the EW test community.

2.2 ADS IN THE EW TEST PROCESS

Using ADS to link models, simulations, and actual hardware in real-time, it is easy to postulate an ADS test environment that combines the available test resources used in the EW test process to produce an enhanced test environment to support EW system T&E. Such an environment is depicted in figure 2-2.

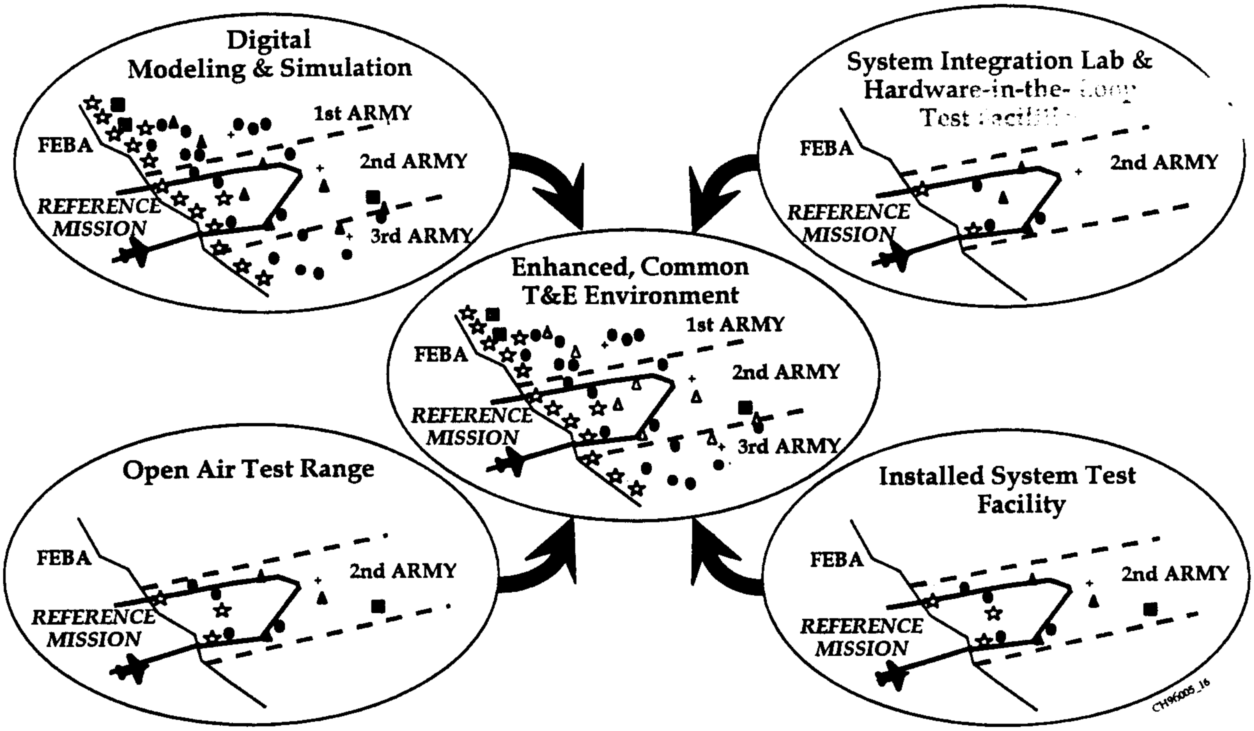

Figure 2-2. ADS-Enhanced Test Environment

Conceptually, this integrated test environment could support all phases of the EW system life cycle. It would act as a force multiplier, leveraging test resources not normally available to the tester at a given stage of development to allow higher fidelity, more operationally realistic testing earlier in the development and test process.

During concept exploration and definition, high fidelity real-time digital models of the proposed EW system could be linked with mission level models, HITL and OAR assets, and human-in-the-loop simulators to provide a high fidelity, dynamic "test before you build" capability for evaluation of the system under more realistic operational conditions. System specifications could be directly evaluated and optimized against operational performance, giving the EW system evaluators a direct link between system specifications and operational requirements. Measures of Performance (MOPs) could be established early to ensure they accurately represent operational requirements and they could be collected in a virtual environment that replicates the operational environment using the actual test assets that would be used later in formal DT&E and OT&E.

As the EW system development progresses through the Demonstration and Validation, and Engineering and Manufacturing Development stages, emerging hardware could be substituted for modeled components of the EW system, allowing incremental evaluation of the developmental system in an operationally realistic test environment. This process could allow system performance to be evaluated directly against established MOEs and MOPs in the event critical EW system specifications fluctuate due to changes in the threat or specified performance goals cannot be achieved. When the EW system is ready for OT&E, the evaluators will already have strong insight into the performance of the system in an operational environment. Actual test and evaluation scenarios could be selected based upon known areas of concern identified during earlier linked testing. Test scenarios could be rehearsed in the ADS environment prior to field testing to further optimize and refine valuable field test missions. The linked test environment could be used directly in OT&E to investigate areas where field testing is impractical (e.g., pilot end game maneuvers during missile engagements and evaluations requiring large numbers of assets that cannot be practically assembled on a test range). After system fielding, the linked test environment could be used to assess the EW system's continuing viability in the changing threat environment to refine requirements for system upgrades or follow-on systems and to evaluate the effectiveness of proposed system modifications.

Finally, the ADS linked test environment would close the gap between training and testing. Field operators could be trained in the linked test environment and participate in system evaluations, enhancing evaluators' understanding of system performance by the end user. In addition, the linked test environment could provide high fidelity training tools for such areas as mission rehearsal and tactics development.

2.2.1 An ADS Architecture for EW

Effective EW system testing requires appropriate representations of the SUT, and the relevant portions of the operational environment. This is true for all phases of testing, from M & S to flight testing. JADS has divided the fundamental building blocks required to accomplish full-up mission level EW testing into six functional areas:

a. Representation of the EW SUT

b. Representation of the host aircraft

c. Representation of the enemy command and control structure

d. Representation of the friendly command and control structure

e. Representation of other "reactive" red players (terminal threats, airborne interceptors, etc.)

f. Representation of other "reactive" blue players (standoff jamming, other players in a formation, etc.)

Multiple representations of each of the fundamental building blocks are currently available to the EW tester in each of the three categories of representation recognized in the ADS community: constructive (e.g., digital models), virtual (e.g., HITL test assets that are not constrained in time/space representation), and live players (e.g., OAR assets or real aircraft). To illustrate, enemy IADS command and control functions can be represented using digital IADS models; in a virtual representation using HITL assets such as the Air Force's Real-time Electronic Digitally Controlled Analyzer Processor (REDCAP) facility, the Army's Threat Simulator Management Office (TSMO) facility, or a combination of both; or in a live representation using OAR assets. Using an ADS linking architecture, it is possible to link the fundamental building blocks required to conduct an EW test in any of the three representations described above. This is depicted in figure 2-3 for the IADS example.

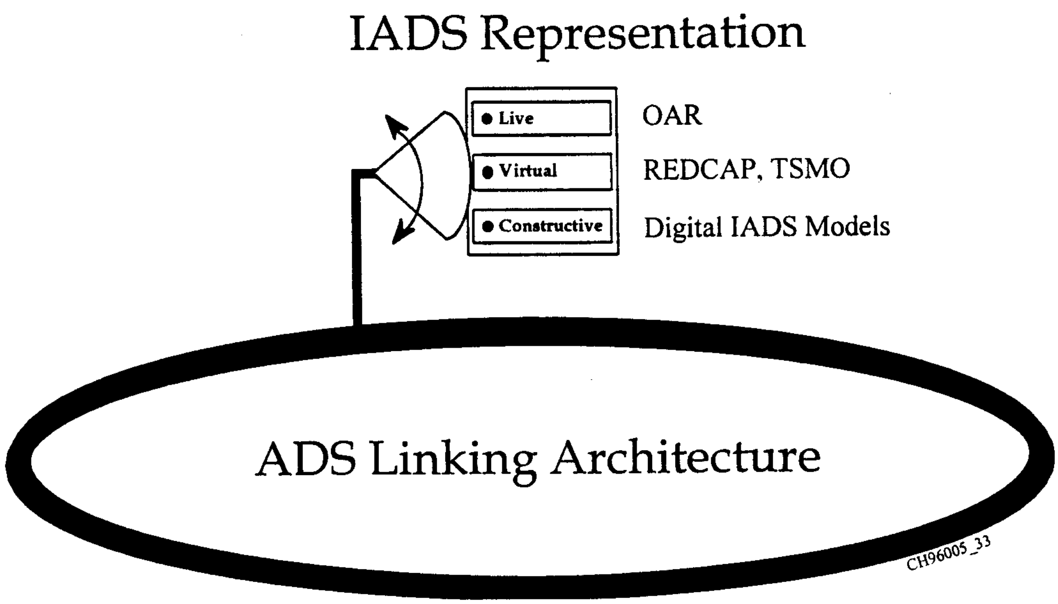

Figure 2-3. IADS Representation in an ADS Linking Architecture

Using a similar approach, a full-up mission test scenario could be developed using appropriate representations of the fundamental building blocks in an ADS environment. Such a test scenario is shown in figure 2-4. Again, the system evaluator would have the flexibility to vary the complexity and fidelity of the test by choosing the individual functional elements to suit his requirements.

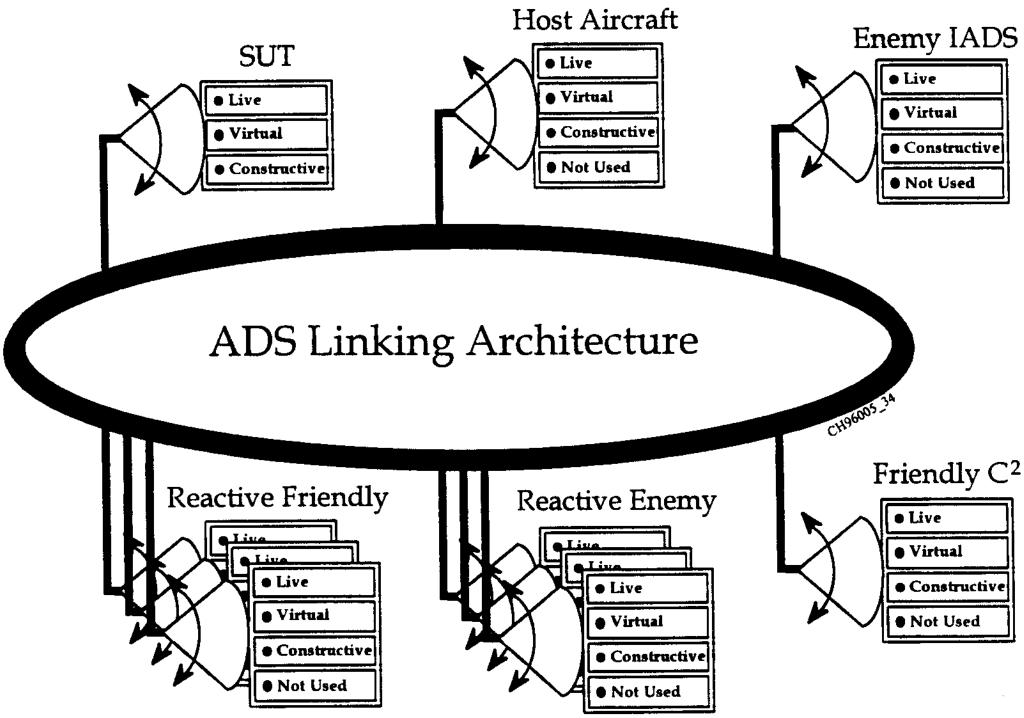

Figure 2.4. Mission Level Scenario in an ADS Linking Architecture

2.3 JADS EW T&E OBJECTIVES

While it is relatively simple to conceptualize an ADS environment to support EW T&E, it is relatively difficult to show this utility in the real world. There are significant technical challenges to fully implementing ADS in EW T&E that must be evaluated. The achievable performance that can be obtained from ADS to support the EW test process must be determined. Programmatic issues, such as cost and schedule impacts, must be considered. The objective of the JADS EW T&E is to address these questions and thus assess the utility of ADS to EW test and evaluation.

The issues and objectives for the JADS EW test mirror the JADS level issues and objectives. They are shown in Table 2-1 and discussed in detail in Section 4.1.

Table 2-1. JADS EW Issues and Objectives

Issues	Objectives
Issue 1: What is the present utility of ADS, including DIS, for T&E?	Objective 1-1: Assess the validity of data from tests using ADS, including DIS, during test execution. Objective 1-2: Assess the benefits of using ADS, including DIS, in T&E.
Issue 2: What are the critical constraints, concerns, and methodologies when using ADS for T&E?	Objective 2-1: Assess the critical constraints and concerns in ADS performance for T&E. Objective 2-2: Assess the critical constraints and concerns in ADS support systems for T&E. Objective 2-3: Develop and assess methodologies associated with ADS for T&E.
Issue 3: What are the requirements that must be introduced into ADS systems if they are to support a more complete T&E capability in the future?	Objective 3-1: Identify requirements for ADS systems that would provide a more complete T&E capability in the future.

2.4 Limitations & Constraints

A complete assessment of ADS utility to the EW test process requires the application of the technology to all phases of the test process as the process is applied to the full range of EW systems. The EW test concept will apply ADS as much as possible to the testing of a self-protection jammer from early DT&E to OT&E. Technical issues must be addressed and resolved to ensure a valid test environment is maintained.

2.4.1 Test Content Constraints

The primary goal of the test design is to answer technical issues relating to the application of ADS to EW test and evaluation within the considerations identified below. The first decision was how to focus the test while addressing all phases of the EW test process using ADS technology. The decision was to focus on the following technical problems among all the potential technical aspects without limiting the actual scope of the test:

- Inherent limitations in the implementation of the test process - correlation, resources, and fidelity
- Technical issues with implementation of an ADS EW environment
    - High fidelity, real-time model of system under test
    - Timing and synchronization of EW engagements
    - Signal verification instrumentation
    - ADS impacts to test results
    - Closed-loop effectiveness testing of installed system under test
    - Multispectral environment
    - Mission level test environment
    - Target, ECM, Clutter Signal Injection System (TECSIS) capability

Another test content consideration is to identify and address the dependency of any phase of the test on the development or upgrade of test assets. During the analysis leading to the test concept we identified several requirements to develop new test assets or to upgrade existing facilities to increase the numbers of resources or to increase the fidelity of the test. This test relies on development and/or upgrades to existing facilities or models and will mitigate risk through a phased development and test process.

Another technical consideration was to ensure adequate test rigor. One of the key technical issues relating to ADS use in testing EW systems is related to the level of instrumentation needed to verify that digital signals sent from one facility to another represent the actual radio frequency signals exchanged by the self-protection jammer and the terminal threat. Although instrumentation represents a considerable cost of the test, we believe such rigor is a requirement for adequate evaluation of the technology.

The actual test of a SPJ described in this document is projected to provide enough information to address the wide range of technical issues identified for the JADS JT&E.

2.4.2 Schedule Constraints

The current JADS JTF is chartered and has personnel assigned through FY99. We established a key goal to design an EW test program which could be completed within three years, or within the current charter.

2.4.3 Personnel Constraints

The final constraint imposed on the EW test program was to conduct the test program using current JTF assigned personnel augmented by experienced contractor and test facility personnel. The primary reason for this decision was a recognition that we could not identify and assign skilled additional personnel to the test force within the time frame required by the test schedule. Therefore, we included contractor engineering and analysis support in the estimated test cost.

2.5 SCOPE OF JADS EW JT&E

The JADS EW test program is designed to (1) identify the utility of ADS to EW test and evaluation; (2) identify the critical constraints, concerns, and methodologies when using ADS for EW test and evaluation; and (3) identify the requirements that must be introduced into ADS systems if they are to support a more complete EW test and evaluation in the future. The current EW test program was developed by applying these requirements and the constraints identified above. This application of requirements and constraints resulted in a test program which combines a multiphased test of a self-protection jammer in an ADS environment with a leveraged program, the Advanced Distributed Electronic Warfare System (ADEWS), designed to enable JADS to broaden its findings on ADS utility to EW T&E.

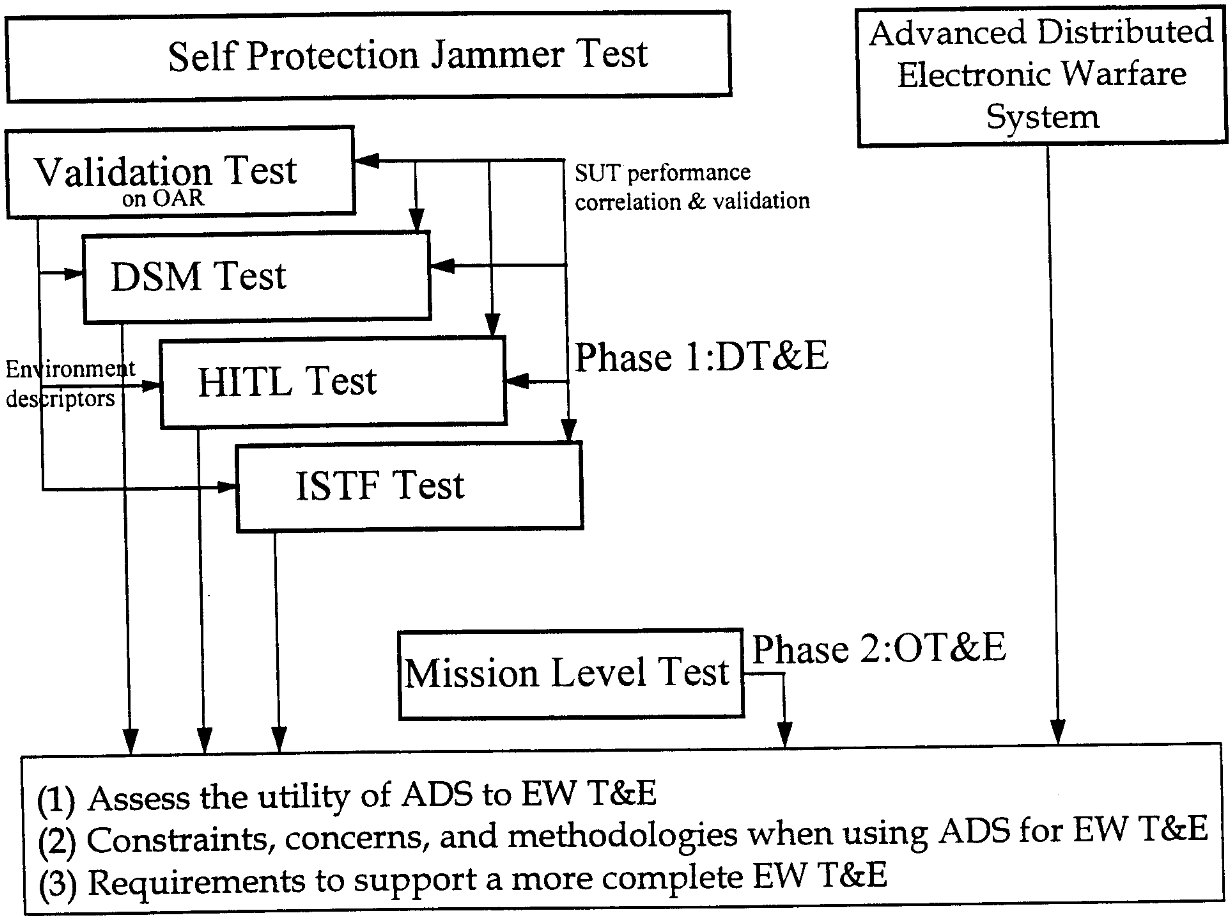

Figure 2-5. JADS EW Multiphased Approach

The JADS EW multiphased test approach is designed to assess the utility of ADS to EW T&E by testing the technology's ability to provide improved performance within an acceptable cost and schedule. The leveraged ADEWS proof-of-principle demonstration activities and SPJ test events will provide the data to validate the technical feasibility of using ADS to evaluate the potential enhancements to the EW test process and to solve the inherent limitations of the EW test process.

2.6 JADS EW T&E Concept

This section describes the details of the elements comprising the EW test concept: the multiphased Self-protection Jammer test and the ADEWS proof-of-principle demonstration. The June 1994 SAC tasked JADS to complete the test design for EW using ADS, focusing on an airborne SPJ. Using ADS for linking EW facilities and ranges, the test scenario would represent a penetrating strike aircraft crossing a Forward Edge of Battle Area (FEBA) protected by an IADS. Consequently, the central focus of the EW T&E concept was based upon the full range of SPJ testing using ADS capabilities as briefed to the Technical Advisory Board in May 1995.

The JADS test concept for evaluating the utility of ADS as a solution to problems in EW T&E (i.e., correlation and validation, limited resources, and fidelity) includes many of the potential applications of ADS in the EW test process. The JADS EW multiphased approach will obtain ADS performance information from most types of test activities in the EW test process.

A concept for using ADS for T&E requires an underlying design of the linking environment to provide appropriate connectivity between the system under test (SUT) and other assets required for the test. For EW testing, the scope of this effort extends beyond the current DIS PDU definitions, IEEE 1278 standards, and previous linking demonstrations. The JADS EW test concept follows a logical building block approach that can be applied as a pattern to future test approaches for ADS use. The concept begins with the definition and 'wringout' of a proposed ADS architecture for EW T&E, then defines in greater detail an ADS environment specification required for EW T&E and the SPJ test, and then executes each of the phases of ADS testing in that environment following the EW test process applied to the self protection jammer as the system under test.

The JADS test concept includes broadening upon the ADS related information derived from these primary ADS test efforts focused on the SPJ to other types of EW systems and tests using ADS. The other elements completing the approach for determining ADS utility for EW T&E are the ADEWS test activities.

2.6.1 Self-protection Jammer Test

2.6.1.1 SPJ Test Organization

The SPJ test is focused on answering technical and programmatic questions relating to the use of ADS to support electronic warfare developmental and operational test and evaluation. The ADEWS effort is designed to provide many insights into the utility of ADS to support EW testing of C^3 systems.

The SPJ test has been designed as a two phase test focusing on the EW test process during developmental and operational test and evaluation. Phase I consists of four tests focused on EW developmental test activities using a digital system model, hardware-in-the-loop, and installed system test facility. A validation test is included to provide baseline SUT performance data. Phase II is an operational test consisting of four penetrators, four cover/support aircraft, stand-off jammer support, friendly Airborne Warning and Control System (AWACS), enemy IADS, enemy airborne interceptors, and enemy AWACS to represent a mission level (OT&E) test.

2.6.1.2 Phase I Test Overview

The first test is a flight test of an SPJ on an OAR. The purpose of this test is to establish a baseline of environment and performance data which will be used to develop the ADS test environment for the following phases and will be the basis for determining the validity of the ADS test results. Additionally, the performance data will be the baseline for attempting to correlate the data across all other phases of the test using ADS. Although flight testing of the SPJ would normally occur at the end of the DT&E portion of the EW test process, we are conducting this phase first to collect the SUT performance and environment data required to replicate the test in the ADS environment.

Test 2 is a test of a high fidelity DSM of the SPJ linked with HITL terminal threats and a constructive model of an IADS. The threat laydown from the open air range will be replicated in the synthetic ADS environment and the SUT will be flown, via a scripted flight profile developed from the actual OAR flights, through the IADS, engaging the high-fidelity terminal threats. In the normal EW test process, the DSM would be developed as a tool for requirements analysis early in the development of a new system and would not typically be tested in a high-fidelity threat environment. This phase will evaluate the ability to apply increased fidelity and resources through ADS early in the development cycle and to develop requirements for a new system through actual effectiveness testing of a digital model of the proposed system.

Test 3 is a test of the SPJ in a EW "hot bench" configuration linked with HITL terminal threats and a constructive model of an IADS. The threat laydown from the open air range will be replicated in the synthetic ADS environment and the SUT will be flown, via a scripted flight profile developed from the actual OAR flights, through the IADS, engaging the high-fidelity terminal threats. This phase will evaluate the ability to increase fidelity and resources through ADS and perform developmental as well as effectiveness testing on a brassboard configuration of the SUT in a SIL.

Test 4 is a test of the SPJ installed on an actual aircraft located in an ISTF. The facility will be linked with HITL and the constructive model of the IADS using the same threat laydown as the previous tests and controlled by the same scripted flight profile. In the normal EW test process, ISTF testing is used late in the development cycle to measure the effect of aircraft systems on the performance of the SPJ. This type of testing does not normally provide a detailed measure of the effectiveness of the jammer against a variety of threats. This test will not only evaluate the installed system in the normal mode but will also evaluate the ability to perform closed-loop effectiveness testing of the jammer installed on the aircraft prior to flight test.

2.6.1.3 Phase 2 Test Overview

After EW DT&E activities are accomplished, a second test phase for OT&E will be accomplished. This test phase will assess the utility of ADS to establish a mission level test environment for OT&E. The OT&E mission will consist of four penetrators with self-protection systems, four cover/support aircraft with self-protection systems, stand-off jammer support, friendly Airborne Warning and Control System (AWACS), enemy IADS, enemy airborne interceptors, and enemy AWACS. The spectrum for the mission level test will be extended beyond radio frequency (RF) to include infrared systems (IR) such as missile warning and IR search and track.

The scenario laydown will be based on the Iraqi 2010 environment and include a number of conventional pulse and pulse doppler radar systems as well as IR surface-to-air missiles (SAMs). The mission will consist of an air interdiction by a flight of four aircraft with air-to-air engagements involving the four cover/support aircraft.

Having validated the application of ADS in the DT&E tests, the same ADS assets will be used to perform OT&E. In addition, high and low fidelity flight simulator labs will be linked into the ADS environment and used for air-to-air encounter assessment for both friendly and enemy aircraft. The friendly stand-off jammer and enemy victim early warning, GCI, and acquisition radars will be simulated in a HITL environment. The friendly AWACS capability will be provided by Theater Air Command and Control Simulation Facility (TACCSF) using man-in-the-loop assets.

The SPJ test phases will be described in greater detail in Section 3.

2.6.2 Advanced Distributed Electronic Warfare System (ADEWS)

2.6.2.1 Purpose

The ADEWS, developed by the U.S. Army, utilizes features of ADS in a unique manner to provide a realistic OAR communications jamming capability for testing sophisticated communications systems and tactical C3 networks. Since communications jamming is a significant T&E issue in the EW systems operational arena for all three Services, JADS is using this program to provide a broader understanding of the utility of ADS to EW T&E.

2.6.2.2 Overview of ADEWS

Adequate realistic testing in an EW environment to improve development of military tactical communications systems has never been conducted with large scale units. Likewise, tactical training does not include realistic operations involving EW. Many factors contribute to current T&E shortcomings and are similar across all types of EW. The live open air jamming is impractical in most cases due to spectrum and Operations Security (OPSEC) constraints. Jamming interferes with commercial systems in addition to the intended military victims. The Federal Communications Commission (FCC) places strict limits on when, where, and which jamming signals can be broadcast. Additionally, some of the most effective jamming techniques are classified and cannot be broadcast during peacetime.

As more radio systems, such as Secure Packet Radio, Land Mobile Radio, and Near-term Digital Radio are considered for fielding, and as our forces become more reliant on wireless communications to support the digital battlefield, the threat of effective communications jamming becomes a growing issue which directly impacts mission accomplishment. A means of realistic testing and training in an EW environment is needed to identify vulnerabilities so that corrective measures can be devised and implemented.

The Army is developing ADEWS as the proposed solution to this requirement. ADEWS is an enhancement of a special EW system called the Covert Remote Electronic Warfare Simulator (CREWS). CREWS was developed by the Electronic Proving Ground (EPG) at Fort Huachuca, Arizona, to overcome existing limitations and restrictions on open air EW operations including those imposed by the FCC and the Federal Aviation Administration (FAA). This technology may make the use of EW environments affordable for testing and training. The major components of the ADEWS includes: an updated version of the CREWS with a Terrain Propagation Path Loss (TPPL) simulation module, the Improved Field Data Collection (IFDC) system, the Virtual Jammer Simulator (VJS) developed by Threat Simulator Management Office (TSMO), and an instrumentation and control system called the Test Control Center (TCC).

The ADEWS program is organized into two phases: a proof-of-principle phase and a production phase. The proof-of-principle phase, which JADS is focusing on, includes a field demonstration using ADEWS for virtual jamming of an Army communications network supporting a company size tactical unit. ADEWS will investigate the feasibility of introducing a synthetic signal into a victim communications system without the requirement to produce an open air jamming signal. ADEWS is programmable, capable of tailored jamming, has on/off control, is fully instrumented, and is constructed from appropriate technology to satisfy operational testing and training requirements. The production phase of ADEWS is not yet defined.

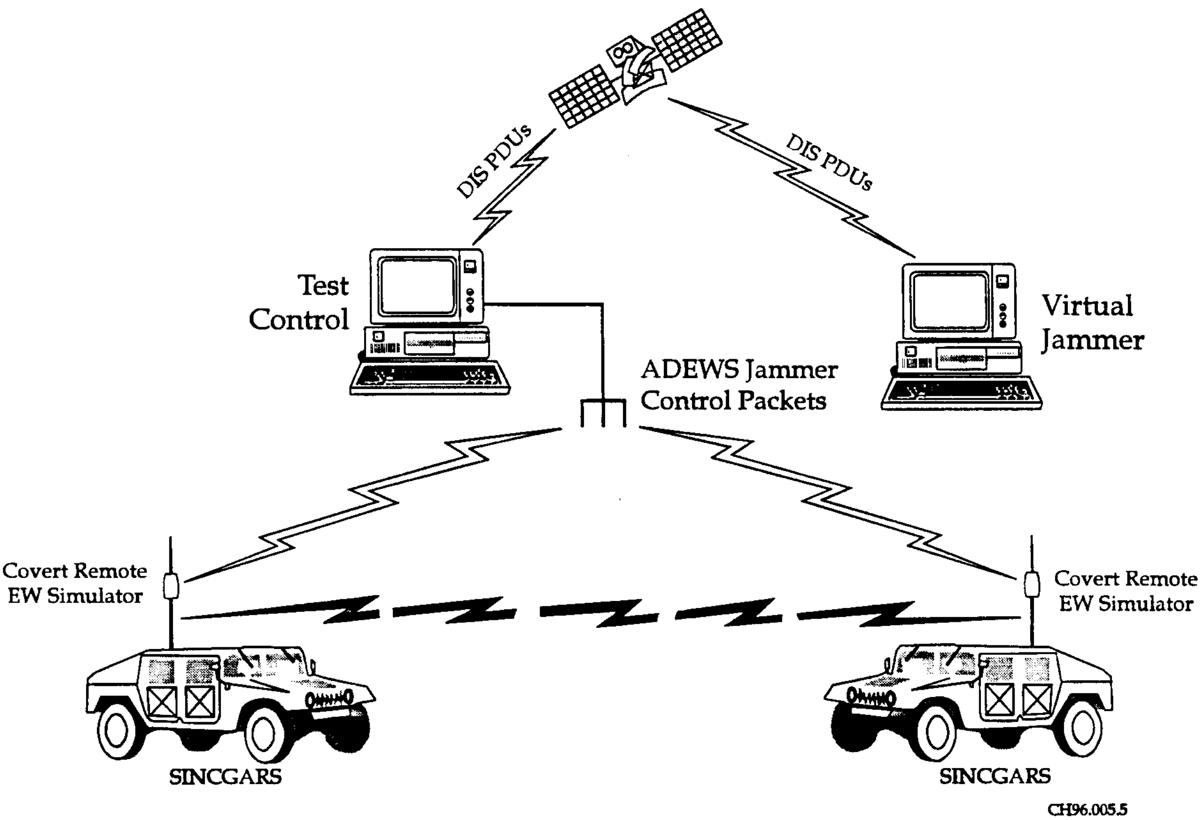

Figure 2-9. ADEWS Test Concept and Components

2.6.2.3 JADS EW Interest

JADS will investigate ADS capabilities for communications jamming T&E as implemented by the ADEWS distributed architecture and collect information from the development, use, and results of the ADEWS proof-of-principle demonstration scheduled during the fall of 1996. The Army has also requested JADS assistance in developing a Verification, Validation, and Accreditation (VV&A) plan for ADEWS. From the insight gathered in the VV&A planning process, as well as the operational demonstration of ADEWS in the field with live players, JADS will gather and analyze relevant ADS data to broaden the determinations and conclusions about results of ADS use in EW T&E. Table 4-1 provides further detail on specific issues, data collection, and analysis that JADS will apply to the ADEWS effort.